

Oregon Wasted Food Study: Institutional and  
Commercial Sector Case Studies

**Case 12**

**Dynamic PARs to reduce wasted food in a grab and go setting**



This report was prepared for  
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# Introduction

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This is a report on the methods and results of one of 15 food service business case studies, as part of the institutional and commercial (IC) sector portion of the Oregon Wasted Food Study. This study is funded by the Oregon Department of Environmental Quality and conducted by Community Environmental Services (CES) at Portland State University.

The research objectives for the IC portion of this study are to:

- Understand components of wasted food in IC sector
- Highlight causes of commercial wasted food and key opportunities for waste prevention
- Test wasted food reduction best practices and quantify their effectiveness
- Promote wasted food reduction best practices for application at commercial food service institutions

## Focus of study

This study examines major types and causes of wasted food associated with grab-and-go operations. It focuses on the processes of periodic automatic replenishment (PARs)<sup>1</sup> setting and demand forecasting and highlights some best practices in grab-and-go display and dynamic PARs setting. In the grab-and-go format, many foods have a shelf life of several days. A combination of dynamic, informed and frequent PARs setting, coupled with frequent (daily) production of smaller batches based on revised PARs, as well as daily deliveries and transfers between locations, and diligence in curating the grab-and-go displays all worked together to prevent the loss of food. Implementing production and waste tracking further improved these systems, providing staff information on daily, product-level demand in order to more dynamically adjust PARs. Waste tracking was key to better understanding the nature of waste in these operations, especially because the business had no prior data on production or waste amounts. Sales data analysis was also conducted to understand the dynamic environment this business operated in and explore how tools could better translate sales information in operable data to inform production planning.

## Business context

The business participant is a food service institution with a grab-and-go service operating on a college campus in the Portland metropolitan area. Grab-and-go food (such as pre-made sandwiches, snacks and desserts) is available at five of the business' campus locations and prepared at a central commissary style kitchen.

# Methods

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## Study design

The study was conducted over a six month period from February 2018 to July 2018. It included employee interviews, sales data analysis, and production and waste tracking. The intent of these analyses was to (1) identify types of wasted food and key causes of waste, (2) highlight best source reduction practices for grab-

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<sup>1</sup> PARs, or periodic automatic replenishment, are set production amounts by time-of-day or day-of-the-week that are generally set by management and followed by preparation staff. Some businesses have standard PARs across days or menu items, while others adjust their PARs according to anticipated customer demand.

and-go operations and (3) observe the effectiveness of production and waste tracking at informing PARs setting.

## Interviews

A total of three employees were interviewed for this study, including a retail manager, the executive chef and the sustainability coordinator. Initial interviews were conducted in February 2018, with a follow up interview with the retail manager in July 2018.

Employees voluntarily participated in one-on-one interview, on-site, but in a private location. Interviews were recorded and took between 10 and 20 minutes each. The interviews were semi-structured: standard interview questions were asked of each employee with additional questions asked that either responded to employee answers or pertained to their specific role.

## Sales data

The business supplied researchers with weekly sales reports from all five locations for the majority of the fall and winter academic quarters (roughly September 2017 through March 2018). Sales reports were analyzed in Microsoft excel, where grab-and-go products were isolated and compiled over time. The intent of analysis was to observe variations in demand and explore how, if at all, product level sales data over time could be helpful in the PARs planning process.

## Production and waste tracking

Beginning in mid-March, the business implemented a new system of production and waste tracking for their grab-and-go. This system took the form of paper spreadsheets used by managers at each of the business' five campus locations to record daily orders received and items discarded (those beyond the three day best-by window) for each product offered. These sheets were submitted weekly to the manager responsible for PARs setting and the person responsible for ordering. These records were analyzed for this study, and used to quantify the amount of leftover product that was being generated as a means of observing the effectiveness of dynamic PAR setting. Post-practice interviews were also conducted to understand how the tracking process went and how records themselves were used (or not used) to inform PARs and ordering.

# Results

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## Interviews

### Causes of waste and barriers to prevention

#### New account opening led to overproduction

All of the employees interviewed said they thought the relatively recent opening of the account (the business took over food service at this college in September 2017 and interviews occurred in February 2018) was a primary cause of waste. Primarily, this caused waste from overproduction because of overly ambitious PARs setting. They said they were **“still learning what items sell and what do not.”** Furthermore, they suggested they were working to solidify processes for PARs setting and adherence, ordering, and delivery, though these

were quickly improving. The relatively recent opening also meant employees had not been there long and not all of them were performing at ideal levels, a manager said.

## Product variety

One employee said they include **some products in their grab-and-go displays just to ensure a wide enough variety of offerings, even though they do not sell at a high volume.** These items are the most likely to go to waste, they said.

## Existing prevention strategies

### Display practices

The manager explained that special care is given to ensuring product display reduces wasted food. They said they **stock the display case one to two products deep, but spread them out horizontally to make the case look full so that items look appetizing and bountiful.** “**The emptier the case looks the slower it moves,**” the manager said.

The business also benefits from employee diligence. The manager checks the case two or three times a day making sure it is properly stocked and displayed, and that **products with the earliest expiration date are at the front.** They said other employees, including front of house staff and other managers, also check it throughout the day.

### Dynamic PARs setting

**The manager relied on both intuition and weekly sales reports to plan for product PARs, instead of relying on standard or default PARs.** “I know what sells,” the manager said. He also said they try to **anticipate anything that would decrease sales volume,** like holidays or poor weather, and plan accordingly. When new items were introduced, they planned conservatively rather than ambitiously, preferring to sell out then have product left over. As the term went on, **they would scale up to meet demand, or drop the product if it was not selling.** These dynamic PARs setting practices were documented throughout the case study, with additional elements added on as the business became more established and the manager became more accustomed to the account. For example, towards the end of the case study the manager started twice-weekly PARs setting to improve adaptability.

### Weekly preparation and delivery schedule

The business reduces wasted food by keeping production flexible. Products are produced on site at the commissary kitchen daily, Monday through Wednesday or Thursday, as needed. This **allows for smaller batches to be made each day and the weekly flexibility discourages extra preparation.** “We only want to make what we absolutely need” the manager said.

The business also benefits from an **efficient and flexible delivery and redistribution system.** Products are delivered to the business’ five campus locations daily if needed, and are shuffled around to different locations if they are not selling. Products left over at the business’ three main locations at the end of the week are brought to two smaller locations that are open on the weekends. The weekend time is meant to be used to sell leftover product, with no new product made for those days. **The manager said “my goal is to have us run out of everything towards the end of Sunday.”**

## Potential prevention strategies

Two of the employees interviewed suggested that **the proposed production and waste tracking practice would support the business' source reduction efforts**. “It will be a very good first step,” a manager said. “It also means I can go on vacation and another employee can set the PARs and do the ordering for me...” they said, “... right now it’s all in my head.”

## Post-practice interview

The employee interviewed to discuss the practice was responsible for PARs setting and overseeing the production and waste tracking system. They said that the system “worked great”, was very reliable and accurate, and helped them set PARs at appropriate levels. They said **their employees had no problems or complaints in using the paper recording system, and that it had quickly become normal**. Besides himself, an inventory manager also used the weekly composite sheets to order ahead for the next week. The inventory manager, according to the employee interviewed, had no problem using the system and found it **helpful to have weekly production and waste numbers to base ordering off of**. When asked how to improve the system the employee said, “I can’t think of anything.”

## Sales data

Results suggest some variability in sales demand over the two academic quarters. The first quarter appears to be much more volatile, as the business figured out PARs after opening the new account and clientele continued to learn about the business and its offerings (Appendix figures A1-A3 and table A1). The second quarter appeared to level out, with the exception of week eight which has an unexplained drop in sales (no university holiday was observed) (Appendix figures A4-A6 and tables).

There were significant weekly variations in sales volume, which impacted product categories (sandwiches, desserts or snacks) as a whole similarly; **a low sales week would see low sales of all product offerings. Patterns within types of product offerings were more random, however, with week-to-week sales varying**.

**The data does not make clear when sales met production (i.e., products sold out) or when product was leftover**. Production records could not be cross-referenced to sales data because production records include only days when products are made. Products are kept on the shelves for three days, meaning they can contribute to sales up to three days post-production. Furthermore, the timeframe used by the business’ accounting software went from Friday through Thursday, while the waste tracking spreadsheets used a Monday through Sunday week, making weekly totals incomparable. This mismatch in data made it difficult to verify whether or not increases in sales corresponded to above-average production.

**The process of analyzing sales by product was onerous because the point of sale (POS) system lacked the capacity to observe product-level data over time**. Rather, researchers had to create their own analytics program in Microsoft Excel to track product sales over times using manually downloaded and inputted weekly sales reports.

## Production and waste tracking



## Records

Production and waste records, recorded by business staff as part of their PARs setting process, were obtained for seven weeks spanning February to May 2018. Records specific to six sandwich offerings were analyzed for (1) the commissary kitchen, outlining overall production PARs for the business' five locations as well as remaining products at the end of the week that did not get sent to a retail location, and (2) the retail location with the highest grab-and-go sales volume, which included the number of products delivered and unsold. Full results from the production records can be seen in the Appendix in tables A5 and A6.

**This analysis suggested the commissary kitchen had very little product remaining at the end of each week**, with remaining product averaging 2.70% over the seven week period, or an average of five products per week, out of 185 produced. **Analysis of the business' highest sales volume retail location (for grab-and-go) found that waste was also low at the retail level**, averaging 6.69% of products ordered from the commissary. This equates to an average of under five products per week, out of 70 ordered.

## Limitations

Production and overproduction data was collected by employees rather than researchers so their accuracy cannot be confirmed. Sales data analyzed here cannot be entirely understood as a reflection of consumer demand as some products may have sold out.

# Conclusions and Future Directions

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## Key findings

**Waste was mostly due to overproduction** because of **overly-ambitious PARs**, particularly during the first few months of operation. The business' **wide product offerings** were another key cause of waste, because some items had consistently low sales but were retained to demonstrate variety.

**Sales volume varies significantly** week-to-week as well as product-to-product. **This suggests simple week-over-week PARs planning may be ineffective if systems are not structured to be adaptable to changes in sales volume.** In the case of this institution, PARs were revised mid-week if needed and items were produced daily, allowing for quick increases in production to meet unexpected increases in sales volume. The results do suggest, however, that better understanding sales dynamics could better inform dynamic PARs setting processes. For example, if a POS system were able to inform users about weekly and daily product sales averages, food service employees could observe daily or weekly sales trends compared to those averages and adjust PARs accordingly. For example, if it were made apparent mid-week that sales for certain products were significantly lower than average, PARs could be revised down for the rest of the week to avoid overproduction. As is, **PARs revisions are reactionary, reacting to product left (or not left) on the shelves. With better understanding of sales dynamics PAR planning could be more proactive, forecasting need.**

The business utilized a number of best practices to prevent the wasting of edible food and promote source reduction. First, they used **dynamic, informed and frequent PARs setting**, which was critical to supporting this business' low-waste grab-and-go operation. Second, they relied on **daily production** during the beginning of the week, alongside **daily deliveries and transfers between locations**, to encourage the

sale of products in a **first-in-first-out** manner and avoid hitting sell-by dates. Finally, the business' employees were **diligent in curating the grab-and-go displays** to ensure the oldest products were in front, products were spread wide to take up space and products were displayed only a few products deep, all of which **support higher sales and reduce the likelihood of spoilage.**

Together, **these dynamic PARs setting and redistribution practices support low levels of documented overproduction** at both the commissary (which averaged only 2.7% overproduction over a seven week period), and the business' largest retail location on campus (which averaged 6.69% waste over the seven week period).

## Production and waste tracking

Overall, the study suggests that production and waste tracking can be an important first step in reducing overproduction in grab-and-go operations. The employee most involved with using the production and waste tracking data found it very helpful in setting accurate PARs. The data was more accessible and relevant than the weekly sales reports previously used, and it was also helpful to increase transparency across staff and allow others to engage with PARs setting process.

One benefit to manual production and waste tracking was that the data provided a more granular view at product-level demand. **Whereas the POS system could only pull weekly sales reports, the production and waste data showed how product was used, and not used, daily over the period of a week.**

## Conclusion

The business studied here demonstrated numerous best practices that worked to minimize overproduction and reduce spoilage by transferring products across the business' venues to ensure its sale. In particular, **the business benefited from twice-weekly PARs setting, conservative planning and expectations of running out of product at the end of the week.** The grab-and-go component **also benefited from watchful employees who kept the shelves properly organized, minimizing over-stocking and encouraging first-in-first-out.** This study suggests that grab-and-go operations can be managed with minimal waste if the proper planning and attention is paid to it.

This case study also observed the effectiveness of waste tracking to inform PARs and promote source reduction. It suggests that **production and waste tracking can be helpful in PARs setting, while negligibly disrupting employees' normal work patterns, but must be integrated into a dynamic PARs setting process,** like the one used here. This is particularly important in frequently changing food service environments, like university campuses, which experience significant fluctuation in sales volume over a given term or semester.

Finally, this case study, as well as others in the Oregon Wasted Food Study, highlight the **need for more advanced and user-friendly POS systems that allow for detailed reporting on product-level sales over time.**

# Appendix

## Sales data analysis: Fall term

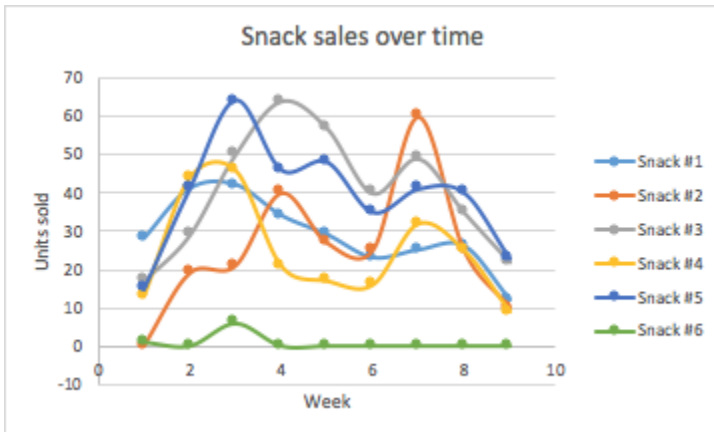


Figure A1: Snack sales over time, fall term

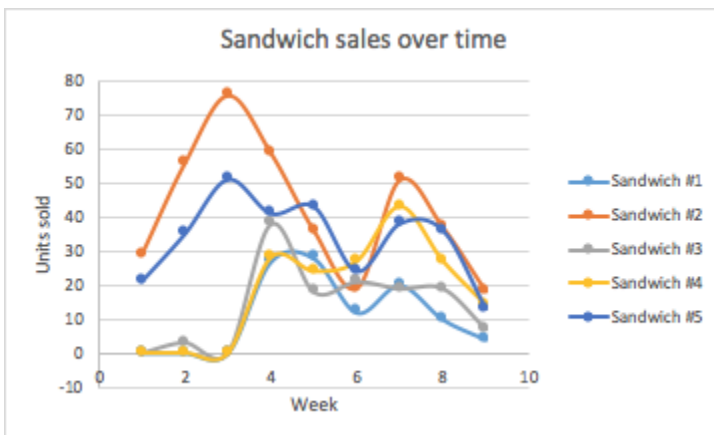


Figure A2: Sandwich sales over time, fall term

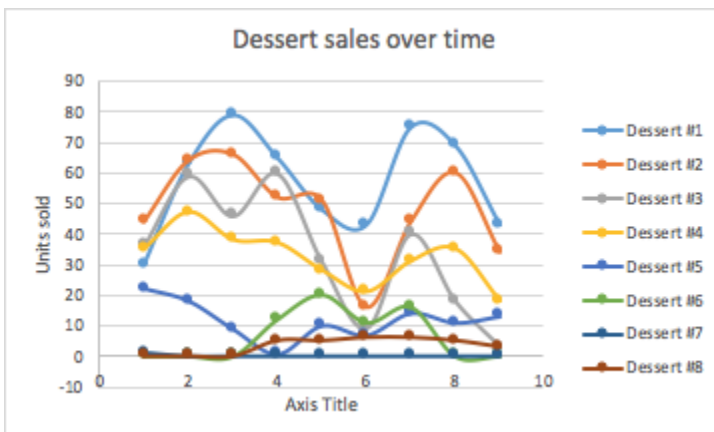


Figure A3: Dessert sales over time, fall term

**Table A1: Product-level analysis for fall term, demonstrating high variability in weekly sales**

		Ave	Min	Max	Std Dev
Snacks	Snack #1	28.9	12.0	42.0	8.7
	Snack #2	25.2	0.0	60.0	16.2
	Snack #3	40.3	17.0	64.0	15.1
	Snack #4	24.8	9.0	46.0	12.5
	Snack #5	39.2	15.0	64.0	13.4
	Snack #6	0.8	0.0	6.0	1.9
Sandwiches	Sandwich #1	11.2	0.0	28.0	10.7
	Sandwich #2	42.3	18.0	76.0	18.4
	Sandwich #3	13.9	0.0	38.0	11.8
	Sandwich #4	18.1	0.0	43.0	14.6
	Sandwich #5	33.6	13.0	51.0	11.3
Desserts	Dessert #1	57.2	30.0	79.0	15.8
	Dessert #2	47.9	16.0	66.0	14.9
	Dessert #3	33.6	3.0	60.0	19.2
	Dessert #4	32.2	18.0	47.0	8.4
	Dessert #5	11.7	1.0	22.0	5.8
	Dessert #6	6.6	0.0	20.0	7.7
	Dessert #7	0.1	0.0	1.0	0.3
	Dessert #8	3.3	0.0	6.0	2.5

Items have been anonymized to protect business anonymity and data confidentiality

**Table A2: Category-level analysis for fall term**

	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Ave	Min	Max	Std Dev
Snacks	74	174	229	205	178	139	207	151	76	159.2	74.0	229.0	52.2
Sandwiches	50	94	127	193	149	103	171	129	56	119.1	50.0	193.0	45.8
Desserts	168	251	238	232	193	113	226	198	114	192.6	113.0	251.0	48.6
Total	292	519	594	630	520	355	604	478	246	470.9	246.0	630.0	132.9

Items have been anonymized to protect business anonymity and data confidentiality

## Sales data analysis: Winter term

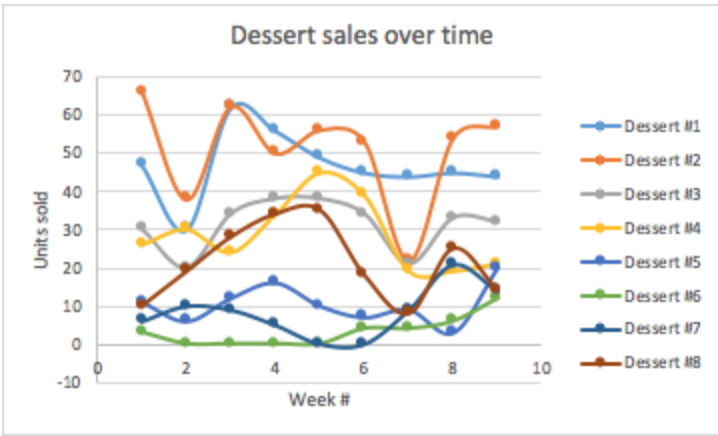


Figure A4: Dessert sales over time, winter term

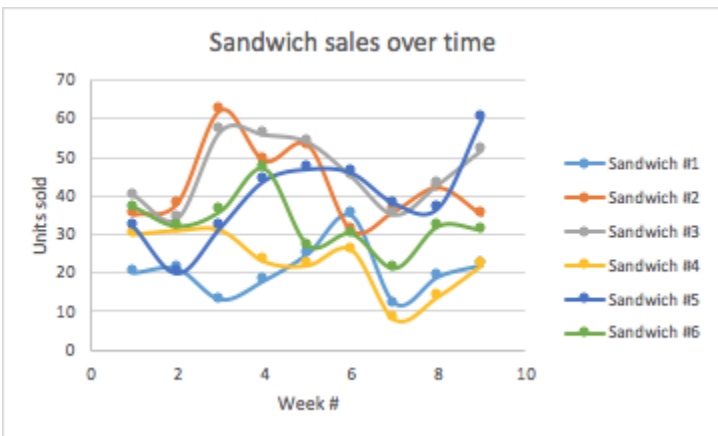


Figure A5: Sandwich sales over time, winter term

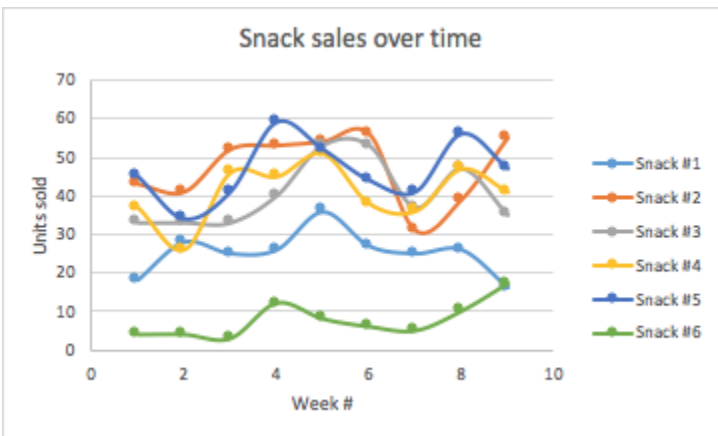


Figure A6: Snack sales over time, winter term

**Table A3: Product-level analysis for winter term, demonstrating high variability in weekly sales**

		Ave	Min	Max	Std Dev
Snacks	Snack #1	25.2	16.0	36.0	5.4
	Snack #2	47.1	31.0	56.0	8.3
	Snack #3	40.4	33.0	53.0	7.9
	Snack #4	40.8	26.0	51.0	7.1
	Snack #5	46.6	34.0	59.0	7.5
	Snack #6	7.7	3.0	17.0	4.3
Sandwiches	Sandwich #1	20.6	12.0	35.0	6.4
	Sandwich #2	42.3	31.0	62.0	9.7
	Sandwich #3	46.2	34.0	57.0	8.4
	Sandwich #4	23.0	8.0	31.0	7.4
	Sandwich #5	39.6	20.0	60.0	10.8
	Sandwich #6	32.6	21.0	47.0	6.8
Desserts	Dessert #1	46.9	30.0	62.0	8.3
	Dessert #2	50.9	22.0	66.0	12.6
	Dessert #3	31.1	20.0	38.0	6.2
	Dessert #4	28.6	19.0	45.0	8.7
	Dessert #5	10.4	3.0	20.0	4.9
	Dessert #6	3.2	0.0	12.0	3.8
	Dessert #7	8.2	0.0	21.0	6.2
	Dessert #8	21.2	8.0	35.0	9.3

Items have been anonymized to protect business anonymity and data confidentiality

**Table A4: Category-level analysis for winter term, showing variable weekly sales**

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Ave	Min	Max	Std Dev
Snacks	180	166	200	235	254	224	175	225	211	207.8	166.0	254.0	28.1
Sandwiches	194	176	231	237	228	213	150	187	222	204.2	150.0	237.0	27.7
Desserts	199	153	231	233	233	200	136	206	214	200.6	136.0	233.0	32.8
Total	573	495	662	705	715	637	461	618	647	612.6	461.0	715.0	82.8

Items have been anonymized to protect business anonymity and data confidentiality

## Production and waste data analysis

Production and waste records were analyzed to observe the effectiveness of dynamic PARs planning processes. The business did not retain all of their records, so the data received was incomplete. In total, seven weeks of data recorded between February 2018 and May 2018 was made available. Only records for the business' six sandwich offerings were analyzed. Production and waste records analyzed were those from the business location on campus with the highest sales volume of grab and go (out of the five business locations on campus), as well as the master production sheet used by the commissary to track PARs, production and product remaining at the end of the week.

In the first table (Table A5), production and waste records can be seen for the commissary kitchen. In the second table (Table A6) analysis results from the single business location are highlighted.

**Table A5: Sandwich production and waste records for the commissary kitchen, by week**

<b>Week</b>	<b>Produced</b>	<b>Remaining</b>	<b>Percent Remaining</b>
2/4/2018	198	6	3.03%
2/11/2018	220	14	6.36%
2/25/2018	244	7	2.87%
3/4/2018	143	<0.01	<0.01%
4/27/2018	164	<0.01	<0.01%
5/4/2018	164	7	4.27%
5/11/2018	164	1	0.61%
<b>Total</b>	<b>1297</b>	<b>35</b>	<b>2.70%</b>

**Table A6: Sandwich production and waste records for the largest business' five retail locations on campus (by grab-and-go sales volume)**

<b>Week</b>	<b>Produced</b>	<b>Remaining</b>	<b>Percent Remaining</b>
2/4/2018	64	7	10.94%
2/11/2018	90	8	8.89%
2/25/2018	78	5	6.41%
3/4/2018	52	2	3.85%
4/27/2018	61	4	6.56%
5/4/2018	79	3	3.80%
5/11/2018	69	4	5.80%
<b>Total</b>	<b>493</b>	<b>33</b>	<b>6.69%</b>